CLAIMS

What is claimed is:

1. An ablative composite assembly comprising, in combination:

a first ablative composite sub-assembly and a second ablative composite sub-assembly; and

a film adhesive coupled to both said first ablative composite sub-assembly and said second ablative composite sub-assembly, said film adhesive joining together said first ablative composite sub-assembly to said second ablative composite sub-assembly to provide the ablative composite assembly when said film adhesive is cured.

2. The ablative composite assembly according to Claim 1 wherein a portion of a surface of said film adhesive is coupled to an end portion of said first ablative composite sub-assembly and a portion of an opposite surface of said film adhesive is coupled to an end portion of said second ablative composite sub-assembly.

3. The ablative composite assembly according to Claim 1 further comprising a housing enclosing said first and second ablative composite sub-assembly.

4. The ablative composite assembly according to Claim 1 wherein said first ablative composite sub-assembly includes a first substantially cylindrical member, wherein said first substantially cylindrical member has an elevated end portion, and

wherein a portion of a surface of said film adhesive is coupled to a portion of a surface of said elevated end portion of said first cylindrical member.

5. The ablative composite assembly according to Claim 1 wherein said second ablative composite sub-assembly includes a second substantially cylindrical member;

wherein a portion of a surface of an end portion of said second cylindrical member is coupled to an opposite surface of said film adhesive; and

wherein a substantially cylindrical protrusion is located at an opposite end of said second cylindrical member.

6. The ablative composite assembly according to Claim 1 wherein said film adhesive is a sealant.

7. The ablative composite assembly according to Claim 1 wherein said film adhesive comprises a thermosetting film adhesive.

8. The ablative composite assembly according to Claim 1 wherein said film adhesive comprises a nitrile phenolic film adhesive.

9. The ablative composite assembly according to Claim 8 wherein the thickness of said film adhesive is about 9 – 11 mils (0.2 – 0.3 mm).

10. The ablative composite assembly according to Claim 8 wherein said film adhesive is unsupported.

11. The ablative composite assembly according to Claim 8 wherein said film adhesive is selected from the group consisting of SCOTCH-WELD™ AF-31 and PLASTILOCK® 655-1.

12. The ablative composite assembly according to Claim 11, wherein said film adhesive is SCOTCH-WELD™ AF-31.

13. The ablative composite assembly according to Claim 8 wherein said film adhesive is cured at a temperature of substantially 300° F (149° C) for at least about 2 hours with a bond line pressure of substantially 25 pounds per square inch (172 KPa).

14. The ablative composite assembly according to Claim 13 wherein said film adhesive is cured at a temperature of substantially 300° F (149° C) for about 3 hours with a bond line pressure of substantially 25 pounds per square inch (172 KPa).

15. The ablative composite assembly according to Claim 1 wherein the ablative composite assembly is made of at least silica phenolic.

16. An ablative composite gas valve comprising, in combination:

a first ablative composite sub-assembly and a second ablative composite sub-assembly;

a housing substantially enclosing said first and second ablative composite sub-assembly; and

a film adhesive coupled to both said first ablative composite sub-assembly and said second ablative composite sub-assembly, said film adhesive joining together said first ablative composite sub-assembly to said second ablative composite sub-assembly to provide the ablative composite gas valve when said film adhesive is cured.

17. The combination of Claim 16 wherein a portion of a surface of said film adhesive is coupled to an end portion of said first ablative composite sub-assembly and a portion of an opposite surface of said film adhesive is coupled to an end portion of said second ablative composite sub-assembly.

18. The combination of Claim 16 wherein said first ablative composite sub-assembly includes a first substantially cylindrical member;

wherein said first cylindrical member has an enlarged opening for hot gas flow through said first cylindrical member and a plurality of openings through said first

cylindrical member;

wherein said first substantially cylindrical member has an elevated end portion and a portion of a surface of said elevated end portion has a multiplicity of openings; and

wherein a portion of a surface of said film adhesive is coupled to a portion of a surface of said elevated end portion of said first cylindrical member.

19. The combination of Claim 18 wherein said first cylindrical member further includes a vertical wall, a portion of a surface of said wall having a multiplicity of radial openings.

20. The combination of Claim 16 wherein said second ablative composite sub-assembly includes a second substantially cylindrical member, said second cylindrical member having an enlarged opening for hot gas flow through said second cylindrical member;

wherein said second cylindrical member has a plurality of openings located through said second cylindrical member; and

wherein the enlarged opening and the openings of the first cylindrical member and the openings located on a portion of the surface of said elevated end portion of said first cylindrical member are in alignment with the enlarged opening and the openings of said second cylindrical member when said first ablative composite sub-assembly is coupled to said second ablative composite sub-assembly.

21. The combination of Claim 20 wherein said second ablative composite sub-assembly further comprises a substantially cylindrical protrusion at an opposite end of said second cylindrical member, said cylindrical protrusion having an enlarged opening for hot gas flow through said second cylindrical member.

22. In a hot gas valve a sub-combination assembly comprising, in combination:

a first substantially silica phenolic ablative composite sub-assembly;

wherein said first ablative composite sub-assembly includes a first substantially cylindrical member, said first cylindrical member having an enlarged opening for hot gas flow through said first cylindrical member and a plurality of openings through said first cylindrical member;

wherein said first substantially cylindrical member has an elevated end portion, a portion of a surface of said elevated end portion having a multiplicity of openings;

wherein a portion of a surface of a vertical wall of said first cylindrical member has a multiplicity of radial openings;

a second substantially silica phenolic ablative composite sub-assembly;

wherein said second ablative composite sub-assembly includes a second substantially cylindrical member, said second cylindrical member having an enlarged opening for hot gas flow through said second cylindrical member and a plurality of openings through said second cylindrical member;

a substantially cylindrical protrusion located at an opposite end of said second cylindrical member, said cylindrical protrusion having an enlarged opening for hot gas flow through said second cylindrical member;

wherein the enlarged opening, the openings of said first cylindrical member and the openings located on a portion of the surface of said elevated end portion are in alignment with the enlarged opening and the openings of said second cylindrical member when said first ablative composite sub-assembly is coupled to said second ablative composite sub-assembly;

a thermosetting unsupported nitrile phenolic film adhesive, a portion of a surface of said film adhesive is coupled to a portion of the surface of said elevated end portion and a portion of an opposite surface of said film adhesive is coupled to a portion of a surface of an end portion of said second ablative composite sub-assembly; and

a steel housing, said housing substantially enclosing said first and second ablative composite sub-assembly and said film adhesive providing a portion of a hot gas valve when said film adhesive is cured.

23. A method for making an ablative composite hot gas valve comprising the steps of:

providing a first ablative composite sub-assembly and a second ablative composite sub-assembly;

providing a housing substantially enclosing said first and second ablative

composite sub-assembly; and

providing a film adhesive coupled to both said first ablative composite sub-assembly and said second ablative composite sub-assembly, said film adhesive joining together said first ablative composite sub-assembly to said second ablative composite sub-assembly to provide the ablative composite hot gas valve when said film adhesive is cured.

24. The method for making an ablative composite hot gas valve according to Claim 23 further comprising the step of:

providing a portion of a surface of said film adhesive is coupled to an end portion of said first ablative composite sub-assembly and a portion of an opposite surface of said film adhesive is coupled to an end portion of said second ablative composite sub-assembly.

25. The method for making an ablative composite hot gas valve according to Claim 23 further comprising the steps of:

providing said first ablative composite sub-assembly including a first substantially cylindrical member, said first cylindrical member having an enlarged opening for hot gas flow through said first cylindrical member and a plurality of openings through said first cylindrical member;

said first substantially cylindrical member having an elevated end portion, a portion of a surface of said elevated end portion having a multiplicity of openings;

wherein a portion of a surface of said film adhesive is coupled to a portion of a surface of said elevated end portion of said first cylindrical member;

providing said first cylindrical member further includes a vertical wall, a portion of a surface of said wall having a multiplicity of radial openings;

providing said second ablative composite sub-assembly including a second substantially cylindrical member, said second cylindrical member having an enlarged opening for hot gas flow through said second cylindrical member;

wherein said second cylindrical member has a plurality of openings located through said second cylindrical member;

wherein the enlarged opening and the openings of the first cylindrical member and the openings located on a portion of the surface of said elevated end portion of said first cylindrical member are in alignment with the enlarged opening and the openings of said second cylindrical member when said first ablative composite sub-assembly is coupled to said second ablative composite sub-assembly; and

providing said second ablative composite sub-assembly further comprising a substantially cylindrical protrusion at an opposite end of said second cylindrical member, said cylindrical protrusion having an enlarged opening for hot gas flow through said second cylindrical member.

26. The method for making an ablative composite hot gas valve according to Claim 25 further comprising the steps of:

cutting said film adhesive to a shape corresponding to the shape of a portion of

the surface of said elevated end portion of said first cylindrical member;

masking off a portion of a surface of an end portion of said first cylindrical member to protect the surface of the end portion of said first cylinder member;

abrading a portion of the surface of said elevated end portion;

abrading a portion of the surface of an end portion of said second cylindrical member;

cleaning a portion of the abraded surface of said elevated end portion and a portion of the abraded surface of the end portion of said second cylindrical member with a solvent; and

blow drying off the solvent in preparation for coupling said film adhesive to a portion of the surface of said elevated end portion and to a portion of the surface of the end portion of said second cylindrical member.

27. The method for making an ablative composite hot gas valve according to Claim 25 further comprising the steps of:

removing a backing from a surface of said film adhesive;

coupling a portion of a surface of said film adhesive to a portion of the surface of said elevated end portion;

tacking said film adhesive;

removing another backing from an opposite surface of said film adhesive while eliminating voids; and

coupling a portion of the surface of the end portion of said second cylindrical

member to the opposite surface of said film adhesive in preparation for curing.

28. The method for making an ablative composite hot gas valve according to Claim 24 further comprising the steps of:

aligning said first ablative composite sub-assembly and second ablative composite sub-assembly;

inserting guide pins through openings of said first cylindrical member and second cylindrical member;

mounting a housing to substantially enclose the combination of said first ablative composite sub-assembly coupled to said second ablative composite sub-assembly;

loading said housing and the combination of said first ablative composite assembly coupled to said second ablative composite sub-assembly into a ventilated oven; and

curing said film adhesive providing said ablative composite hot gas valve.